

# RESEARCH AND ADVANCED DEVELOPMENT Publications FISCAL YEAR 1966

R&AD Program Document 701-2

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CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

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R&AD Program Document 701-2

Approved:

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JET PROPULSION LABORATORY

CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA

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#### FOREWORD

This document, R&AD Program Document 701-2, lists the publications resulting from the JPL research and advanced development program during fiscal year 1966. The entries are based on publications reported by the individuals responsible for the NASA work units of the supporting research and technology program at JPL. Publications are listed according to JPL R&AD categories, subordinate NASA subprograms, and NASA work units.

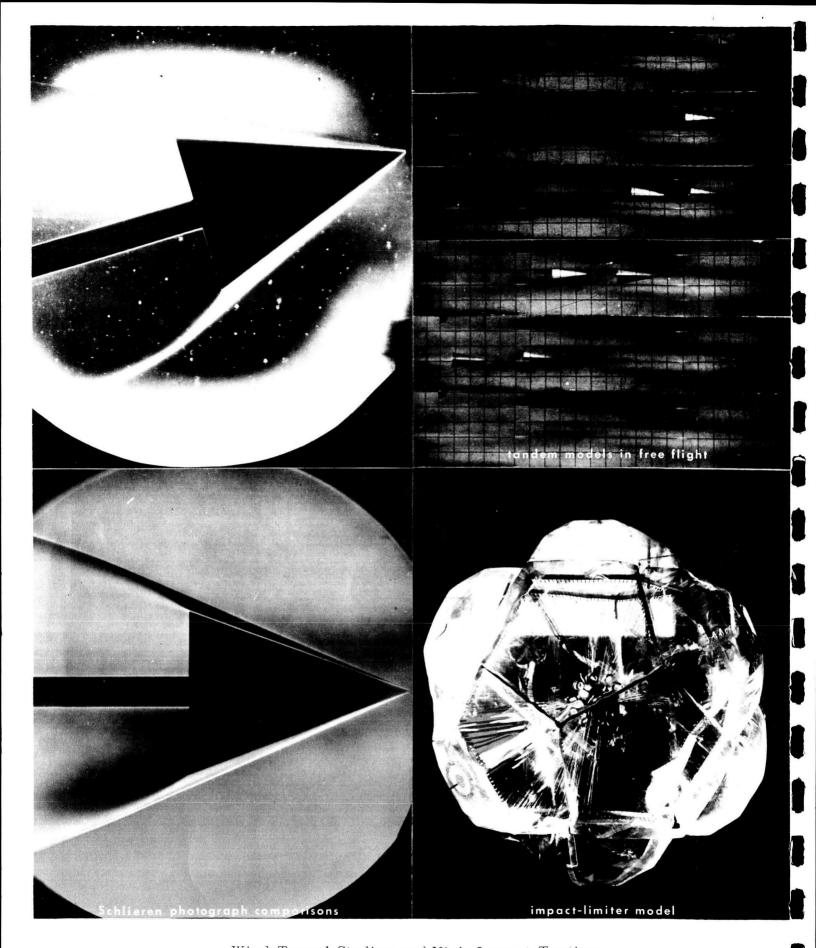
Under each work unit, publications are listed in the following sequence: publications in the open literature and JPL formal publications (JPL Technical Reports and Memorandums), progress reports (JPL Space Programs Summary contributions) and contractor reports (publications by organizations under contract to JPL).

The following abbreviations for JPL publications are used in the bibliographic listings:

TR	Jet Propulsion Laboratory Technical Report
TM	Jet Propulsion Laboratory Technical Memorandum
SPS	Jet Propulsion Laboratory Space Programs Summary

Dates of publication for JPL Space Program Summary reports cited in this document are as follows:

SPS 37-34,	Vol IV	August 31, 1965
SPS 37-35,	Vol IV	October 31, 1965
SPS 37-36,	Vol IV	December 31, 1965
SPS 37-37,	Vol IV	February 28, 1966
SPS 37-38,	Vol IV	April 30, 1966
SPS 37-39,	Vol IV	June 30, 1966
SPS 37-40,	Vol IV	August 31, 1966



Wind Tunnel Studies and High-Impact Testing

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#### ADVANCED STUDIES

684-30

PLANETARY AND INTERPLANETARY

684-30-08-01-55

Advanced Planetary Probe Mission Study

Brereton, R. G., et al., Venus: Preliminary Science
Objectives and Experiments for Use in Advanced Mission
Studies, TM 33-282, May 1966.

Contractor Reports

Advanced Planetary Probe Study, Midterm Technical Progress Report, Thompson-Ramo-Woolridge Systems, 15 March, 1966.

684-30-09-01-55

Jupiter Flyby Mission Study

Contractor Reports

A Study of Jupiter Flyby Missions, Midterm Technical Progress, General Dynamics Fort Worth Division, FZM-4572, February 17, 1966 (under JPL Contract No. 951285).

A Study of Jupiter Flyby Missions, Final Technical Report, General Dynamics Forth Worth Division, FZM-4625, May 17, 1966 (under JPL Contract No. 951285).

#### BIOSCIENCE

189-55

EXOBIOLOGY

189-55-04-01-55

Desert Microflora

Open Literature and Formal Publications

Cameron, R. E., Properties of Desert Soils, In Pittendrigh, C. S., et al, Biology and the Exploration of Mars,

- Chapter 8, pp 164-186; National Academy of Sciences, National Research Council, Washington, D.C., 1966
- Cameron, R. E., Soil Sampling Parameters for Extraterrestrial Life Detection, Journal Arizona Academy of Science, Vol 4, pp. 3-27, March 1966.
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- Cameron, R. E., Blank, G. B., Gensel, D. R., and Davies, R. W., Soil Studies Desert Microflora. X. Soil Properties of Samples from the Chile Atacama Desert, SPS No. 37-35, Vol. IV, pp. 214-223.
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189-58

PLANETARY QUARANTINE/STERILIZATION

189-58-21-01-55

Sterile Assembly Techniques

Progress Report

McDade, J. J., and Magistrale, V. J., Experimental Study of Sterile Assembly Techniques, Final Report, SPS 37-34, Vol. IV. p. 23.

189-58-23-04-55

EASL/SADL Test and Operations

McDade, J. J., Paik, W., Christensen, M., Drummond, D., and Magistrale, V. J., Microbiological Studies Conducted in the Experimental Assembly and Sterilization Laboratory (EASL), SPS 37-34, Vol. IV., p. 30.

#### PHYSICAL SPACE SCIENCE

185-24

INSTRUMENTATION

185-24-05-04-55

Pulse Height Analyzer Development

Progress Reports

Despain, L. G., Pulse Height Analyzer, SPS 37-34, Vol. IV, August 31, 1965, pp. 181-182.

Schneider, W. J., Precision Testing of Pulse Height Analysis, SPS 37-36, Vol. IV, pp. 202-204.

185 - 37

SPACE CHEMISTRY

185-37-20-02-55

# Lunar and Planetary X-ray Diffraction

Open Literature and Formal Publications

Dunne, J. A., The Application of Ross Filters to the Non-Dispersive Analysis of Aluminum and Silicon. Norelco Reporter, Vol. XIII, No. 1, January - March 1966 (reprinted as JPL TR 32-917).

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185-37-20-10-55

# Flight Model Interferometer

Open Literature and Formal Publications

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185-37-20-12-55

# Lunar and Planetary Geophysical Models

Open Literature and Formal Publications

Brereton, R. G., Newburn, R. L., et al., Venus: Preliminary Science Objectives and Experiments for Use in Advanced Mission Studies, TM 33-282, May 1, 1966.

de Wys, J., Choate, R., Miner, E., et al., Surveyor Lunar Scientific Model, Project Document No. 54, issued in sections during the past year.

185-37-20-14-55

# Geosampling (Geological Sampling)

#### Contractor Reports

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185-37-26-03-55

# Gas Chromatograph Column and Detector Development

#### Progress Reports

Wilhite, W. F., A Micro Gas Chromatograph for Descent Analysis of the Martian Atmosphere, SPS 37-35, Vol. IV, pp. 228-234.

185-37-26-06-55

# Interferometric Investigations

Open Literature and Formal Publications

Beer, R., Decrement of the Solar Continuum in the Far Infrared, Nature 209, 1226, 1966.

185-37-26-09-55

# Detection of Life - Related Compounds

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#### Contractor Reports

Hollis, O. L., Separation of Gases by Gas Cell Chromatography at Room Temperature, The Dow Chemical Company, Final Report, May 5, 1966 (Contract No. 951393).

185-37-26-12-55

Ultraviolet Spectrometer Science Support

Open Literature and Formal Publications

Barth, C. A., Ultraviolet Spectroscopy of Planets, TR 32-822, December 15, 1965.

185-41

**ASTRONOMY** 

185-41-21-01-55

Optical Astronomy

Open Literature and Formal Publications

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Spinrad, H., Pyper, P., Newburn, R., and Younkin, R., Further Studies of the Infrared Spectra of Cool Stars, The Water Deficiency in S Stars and the Variation of Water Abundance with Mira's Phase, Astrophysical Journal, 143, 291-298, 1966.

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Younkin, R., A Search for Limonite Near-Infrared Spectra Features on Mars, Astrophysical Journal, 144, 809-818, 1966.

# Progress Reports

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Young, J. W., Aristarchus Observations, SPS 37-34, Vol. IV, pp. 183-4.

185-41-21-02-55

# Radio Astronomy

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Jones, D. E., Observed Venus Microwave Brightness Temperature in the Wavelength Interval 1.25-1.45 cm, SPS 37-36, Vol. IV, p. 208.

185-42

#### PLANETOLOGY

185-42-20-01-55

### Planetology

Open Literature and Formal Publications

Nash, D. B., Proton-Excited Luminescence of Silicates: Experimental Results and Lunar Implications, Journal of Geophysical Research, Vol. 71, No. 10, May 15, 1966, pp. 2517-2534.

185-42-20-02-55

# Petrographic Studies

Open Literature and Formal Publications

Loomis, A. A., A Lunar and Planetary Petrography Experiment, TR 32-785, September, 1965.

185-47

#### PLANETARY ATMOSPHERES

185-47-01-01-55

#### Aeronomy

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Brinkmann, R. T., Green, A. E. S., and Barth, C. A., A Digitalized Solar Ultraviolet Spectrum, TR 32-951, 1966.

# 185-47-26-02-55 <u>Model Atmospheres</u>

Open Literature and Formal Publications

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#### 188-36

# MAGNETODYNAMICS IN SPACE

#### 188-36-01-03-55

# Advanced Magnetometer

Progress Reports

Bunn, J. S., Phase Stable Frequency Doubler, SPS 37-36, Vol. IV, pp. 204-207.

#### 188-46

# ENERGETIC PARTICLES

#### 188-46-01-01-55

#### Radiation Experiments

#### Progress Reports

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Lewyn, L. L. Commutated Analog-to-Digital Converter, SPS 37-37, Vol. IV. pp. 201-203.

Lockhart, R. F., Low Noise Amplifier for Solid State Detectors, SPS 37-35, Vol IV, pp. 251-255.

McDonald, W. S., and Lewyn, L. L., The Spark Chamber Program. SPS 37-35, Vol. IV, pp. 248-251.

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FIELDS AND PARTICLES DATA

385-48-01-01-55

# Analysis of Fields and Particles Data

Open Literature and Formal Publications

Mackin, R. J., Jr., and Neugebauer, M., Editors, The Solar Wind, Pergamon Press, 1966.

Neugebauer, M., and Snyder, C. W., Mariner-2 Measurements of the Solar Wind, The Solar Wind, Edited by Mackin and Neugebauer, Pergamon Press, 1966.

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# SPACECRAFT AND CAPSULE AERO/MECHANICAL ENGINEERING

186-58

PLANETARY QUARANTINE/STERILIZATION

186-58-13-02-55

### Sterilizable Polymers

#### Contractor Reports

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186-68

SPACECRAFT AND CAPSULE EQUIPMENT DEVELOPMENT

186-68-01-01-55

# Planetary Entry and Landing Structures

Open Literature and Formal Publications

Knoell, A. C., Environmental and Physical Effects on the Response of Balsa Wood as an Energy Dissipator, TR 32-944, June 15, 1966.

# Progress Reports

Knoell, A. C., Environmental Effects Upon the Response of Balsa Wood as an Energy Dissipator, SPS 37-34, Vol. IV, pp. 91-92.

# Contractor Reports

General Electric, Development of Energy-Dissipating Plastic Honeycomb, Quarterly Progress Report No. 3, December 31, 1965 through March 31, 1966 (JPL Contract No. 951172).

# 186-68-09-03-55

# Touchdown Stability Study

#### Contractor Reports

Interim Report on Surveyor Lunar Touchdown Stability Study, Bendix Aerospace Division Report No. MM-65-16.

#### 186-68-13-01-55

# Planetary Entry Aerodynamic Deceleration

# Contractor Reports

Mickey, Fred, A Study on Sensor Systems for Initiating
Parachute Deployment for a Mars Entry Vehicle, Northrop
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#### 186-68-13-03-55

# Spacecraft Materials Evaluation

# Progress Reports

Cuddihy, E. F., and Moacanin, J., Outgassing Rates in Polymeric Foams, SPS 37-34, Vol. IV, pp. 137-141.

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Cuddihy, E. F., and Moacanin, J., Development of Sterilizable Elastomeric Foams, SPS 37-36, Vol. IV, pp. 154-158.

Cuddihy, E. F., and Moacanin, J., Method for Calculating Outgassing Rates of Rigid Closed-Cell Foams, SPS 37-37, Vol. IV, p. 149.

Cuddihy, E. F., and Moacanin, J., Studies on Sterilizable Elastomers, SPS 37-37, Vol. IV. p. 150.

Cuddihy, E. F., and Moacanin, J., Outgassing Rates from Plastic-Coated Foams, SPS 37-39, Vol. IV, pp. 106-108.

Farrar, J., and Moacanin, J., Studies on Voltage Breakdown of Closed-Cell Foams, SPS 37-39, Vol. IV, pp. 108-111.

SPACECRAFT TESTING EQUIPMENT AND TECHNIQUES

Advanced Solar Simulation Development

Progress Reports

Youngberg, C., Optical Fabrication of 116-in. Diameter Spherical Metal Mirror, SPS 37-34, p. 116.

Youngberg, C., Advanced Solar Simulator Development, SPS 37-37, p. 107.

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186-71-01-01-55

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124-07 SPACECRAFT AEROTHERMODYNAMICS

124-07-01-01-55 Planetary Entry Gas Dynamics

Progress Reports

Wolf, F., and Spiegel, J. M., Equilibrium Radiation From the Shock Layer for Atmospheric Entry to Mars, SPS 37-36, Vol. IV, pp. 80-84.

124-07-01-04-55 <u>Hypervelocity Laboratory</u>

Open Literature and Formal Publications

- Collins, D. J., and Menard, W. A., Measurement of the Thermal Conductivity of Noble Gases in the Temperature Range 1500 to 5000 Degree Kelvin, Journal of Heat Transfer, Transactions of the ASME, February 1966.
- Thomas, G. M., and Menard, W. A., Experimental Measurements of Non-equilibrium and Equilibrium Radiation from Planetary Atmospheres, AIAA Journal, Vol. IV, No. 2, February 1966.

#### Progress Reports

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- Babineaux, T. L., and Riale, B., Preliminary Performance of a Free Piston Shock Tube, SPS 37-34, Vol. IV, pp. 111-113.
- Horton, R. E., and Babineaux, T. L., An Experimental Assessment of the Effect of Large Amounts of Argon on Stagnation Point Convection Heating in a Planetary Atmosphere, SPS 37-37, Vol. IV, p. 105.
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- Livingston, F. R., and Stickford, G. M., 43-Inch Diameter Shock Tunnel, SPS 37-37, p. 101.

- Menard, W. A., and Thomas, G. M., Ultraviolet Radiation Measurement Capability, SPS 37-37, pp. 102-103.
- Riale, B., Performance Evaluation of a 12-Inch Diameter Free Piston Shock Tube Driver, SPS 37-37, Vol. IV, pp. 103-105.
- Riale, B., and Babineaux, T. L., Performance Evaluation of a 12-Inch Diameter Free Piston Shock Tube, SPS 37-35, Vol. IV, pp. 89-91.

#### 124-07-04-01-55

# 20-Inch Supersonic Wind Tunnel

- Open Literature and Formal Publications
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- Prislin, R. H., The Free Flight and Free Oscillation Techniques for Wind Tunnel Dynamic Stability Testing, TR 32-878, March 1966.

#### Progress Reports

- Enmark, H. T., JPL Tunnel Development: Sector Mock-Up Performance Check, SPS 37-37, Vol. IV, p. 98.
- Goranson, G. M., Free-Flight Wind Tunnel Body-Drogue Studies, SPS 37-35, Vol. IV, p. 83.
- Herrera, J. G., 20-Inch Supersonic Wind Tunnel Nozzle Flow Calibration, SPS 37-37, Vol. IV, p. 96.
- Holway, H. P. Tandem Model Release for Free-Flight Testing, SPS 37-37, Vol. IV, p. 96.
- Holway, H. P., Prislin, R. H., Spinup Device for Non-Planar Flight Testing, SPS 37-38, Vol. IV, p. 65.
- Laumann, E. A., Wakes of Wire-Supported Models, SPS 37-37, Vol. IV, p. 91.
- Prislin, R. H., Holway, H. P., Non-Planar Free-Flight
  Testing in a Conventional Wind Tunnel, SPS 37-37, Vol. IV,
  p. 100.

Walker, B., Voyager Configuration Study, SPS 37-38, Vol. IV, p. 73.

Walker, B., Cone Wake Study, SPS 37-35, Vol. IV, p. 86.

Walker, B., Aspect Ratio Effect, SPS 37-35, Vol. IV, p. 84.

### 124-07-04-02-55

### 21-Inch Hypersonic Wind Tunnel

Open Literature and Formal Publications

Koester, H. and Fox, N., The Use of Conventional Wind Tunnels to Simulate Planetary Atmosphere Aerodynamics TR 32-762, November 15, 1965.

Welton, J., Free-Flight Telemetry Testing in the JPL Wind Tunnels, TR 32-275, September 15, 1965.

# Progress Reports

Marko, W., Entry Capsule Afterbody Configuration Study, SPS 37-35, Vol. IV, p. 77.

Passamaneck, R., Calculation of the Shock Layer for an Axially Symmetric Body in a Reacting Gas in Thermodynamic Equilibrium by a Direct Method, SPS 37-38, Vol. IV, p. 71.

Walker, B., Voyager Configuration Study SPS 37-38, Vol. IV, p. 73.

# 124-08

#### SPACECRAFT STRUCTURES

#### 124-08-03-03-55

# Planetary Entry Heat Shields

Open Literature and Formal Publications

Nagler, R. G., Preliminary Analysis of the Importance of Material Properties and Thermal Inputs on Heat Shields for Mars Entry, Journal of Spacecraft and Rockets, Vol. 3, No. 5 (May 1966), pp. 693-699.

#### Contractor Report

Measured Directional Reflectances of Chars in the UV, Visible and Near Infrared, Arthur D. Little, Inc., March 1966. (JPL Contract 950867.)

124-08-06-03-55

# Spacecraft Shell Structures

Open Literature and Formal Publications

- Martin, H. C., Large Deflection and Stability Analysis by the Direct Stiffness Method, TR 32-931, July 1, 1966.
- Utku, S., Computation of Stresses in Triangular Finite Elements, TR 32-948, July 1, 1966.
- Williams, H., Axisymmetric Thermal Stresses in Sandwich Shells of Revolution and Application to Shallow Spherical Shells, TR 32-920, July 1, 1966.
- An Evaluation of the Effect of Finite Shear Strain in a Shallow Spherical Shell, Williams, H. E., TR 32-780, October 1, 1965.

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- Melosh, R. J., and Christiansen, H. N., Structural Analysis and Matrix Interpretative System (SAMIS) Technical Report, Report No. WDL-EM0766, Philos Corporation, Western Development Laboratories, Palo Alto, California, July 15, 1966.
- Melosh, R. J., Diether, P. A., and Brennan, M., Structural Analysis and Matrix Interpretative System (SAMIS) Program Report, Report No. WDL-EM0766, Philco Corporation, Western Development Laboratories, Palo Alto, California, July 15, 1966.

124-09

SPACE VEHICLE ENVIRONMENTAL FACTORS

124-09-04-01-55

# High-Vacuum Research-Molsink

Open Literature and Formal Publications

Stephens, J., Space Molecular Sink Facility Design, Journal of Spacecraft and Rockets, June 1966.

Stephens, J., Space Molecular Sink Facility Design, TR 32-901, May 1966.

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Stephens, J., High Vacuum Research - MOLSINK, SPS 37-34, p. 114, August 1965.

# 124-09-05-01-55

# Effect of Environment on Spacecraft Thermal Control Materials

### Contractor Reports

Gilligan, J. E., Stable White Coatings, Report No. IITRI-U6004-21, IIT Research Institute, Chicago, Illinois, February 7, 1966 (JPL Contract 950746).

#### 124-09-05-02-55

# Temperature Control of Large Spacecraft

#### Progress Reports

- Rhodes, C. A., Additional Tests on the Half-Scale Thermal Model of the Mariner IV Spacecraft, SPS 37-39, Vol. IV, p. 55.
- A Study of Convective Heat Transfer Within a Lander on Mars, M. Suo, SPS 37-35, Vol. IV, pp. 69-71.
- Thermal Scale Modeling, Vickers, J. M. F., SPS 37-34, Vol. IV, pp. 88-91.

#### Contractor Reports

Chao, B. T., and de Paiva, J., Transient Thermal Scale
Modeling of Spacecrafts, Semi-annual Status Report No. 1,
Department of Mechanical and Industrial Engineering,
University of Illinois, March 18, 1966.

Gabron, F., Thermal Scale Modeling Techniques for Voyager-Type Spacecraft, Report C-66326-02, A.D. Little, Inc., Cambridge, Massachusetts, June 15, 1966 (NASA/JPL Contract No. 951417).

#### 124-09-05-03-55

# Conduction and Radiation in Spacecraft Temperature Control

#### Progress Reports

- Hultberg, J., A Basic Thermal Analysis System Utilizing Computers, SPS 37-36, Vol. IV, p. 84.
- Hultberg, J., Thermal Joint Conductance, SPS 37-38, Vol. IV, pp. 61-63.
- Hultberg, J., Thermal Joint Conductance, SPS 37-39, Vol. IV, p. 53.
- Plamondon, J. A., and J. M. Kendall, Sr., Cavity-Type Absolute Total Radiation Radiometer, SPS 37-35, Vol. IV, pp. 66-69.

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150-22-11-04-55

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128-32-05-02-55

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120-26-04-01-55

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